

REMARKS

A. Allowable Subject Matter.

Applicants would like to thank the Examiner for indicating that claims 16-18, 30, 34-35 and 37-38 contain allowable subject matter

B. Rejections Under 35 U.S.C. §101.

Claims 1-8 and 27-33 were rejected under 35 U.S.C. §101 for failing to support “the claimed invention . . . by either a specific and substantial asserted utility or a well established utility” as well as for lacking a “defined output” (Office Action, ¶¶14 and 16). Applicants respectfully traverse. Claims 27 and 28 have been canceled herein, therefore their rejection is now considered moot. As suggested by the Examiner, Applicants have amended independent claim 1 to make it clear that it relates to a “computer-implemented system” and that this system outputs data. It is therefore believed that claims 1-8 and 29-30 are allowable under 35 U.S.C. §101. Applicants respectfully submit that the rejection under 35 U.S.C. §101 has been overcome, and request that it be withdrawn.

Claims 9-26 and 34-38 were also rejected under 35 U.S.C. §101 for failing to support “the claimed invention . . . by either a specific and substantial asserted utility or a well established utility” (Office Action, ¶15). Applicants respectfully traverse. As a threshold matter, Applicant’s respectfully submit that rejected claims 14-15 and 21-23 have previously been canceled, therefore their rejection under 35 U.S.C. §101 is moot. For the remaining rejected claims, and as suggested by the Examiner, Applicants have amended independent claim 9 to make it clear that it relates to a “computer-implemented method.” It is therefore believed that

claims 9-26 and 34-38 are allowable under 35 U.S.C. §101. Applicants respectfully submit that the rejection under 35 U.S.C. §101 has been overcome, and request that it be withdrawn.

Claims 40-42 were also rejected under 35 U.S.C. §101 for failing to “recite any structural or functional relationships” (Office Action, ¶17). Applicants respectfully traverse. It is respectfully submitted that claim 40 has been amended herein to recite that it is a “computer-implemented distributed simulation” which outputs data. Claim 40 therefore recites functional relationships between the computer-implemented distributed simulation and the output data, wherein a minimum speed of the simulation is specified in the claim. It is therefore believed that claims 40-42 are allowable under 35 U.S.C. §101. Applicants respectfully submit that the rejection under 35 U.S.C. §101 has been overcome, and request that it be withdrawn.

C. Rejections Under 35 U.S.C. §112.

The Office Action also rejected claims 1-42 under 35 U.S.C. §112, first paragraph, suggesting that, because “the claimed invention is not supported by either a specific or substantial asserted utility or a well established utility . . . , one skilled in the art clearly would not know how to use the claimed invention” (Office Action ¶19). As a threshold matter, Applicant’s respectfully submit that rejected claims 14-15 and 21-23 have previously been canceled, therefore their rejection under 35 U.S.C. §112 is moot. Furthermore, claims 27 and 28 have been canceled herein, therefore their rejection is now considered moot. For the remaining rejected claims, Applicants respectfully submit that their rejection under 35 U.S.C. §101 has been overcome hereinabove, therefore their rejection under 35 U.S.C. §112 has been overcome for the same reasons. Applicants therefore respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph.

C. Claims 9, 12-13, 19-20 and 24-26 were rejected under 35 U.S.C. §102(a) as being anticipated by Liu.

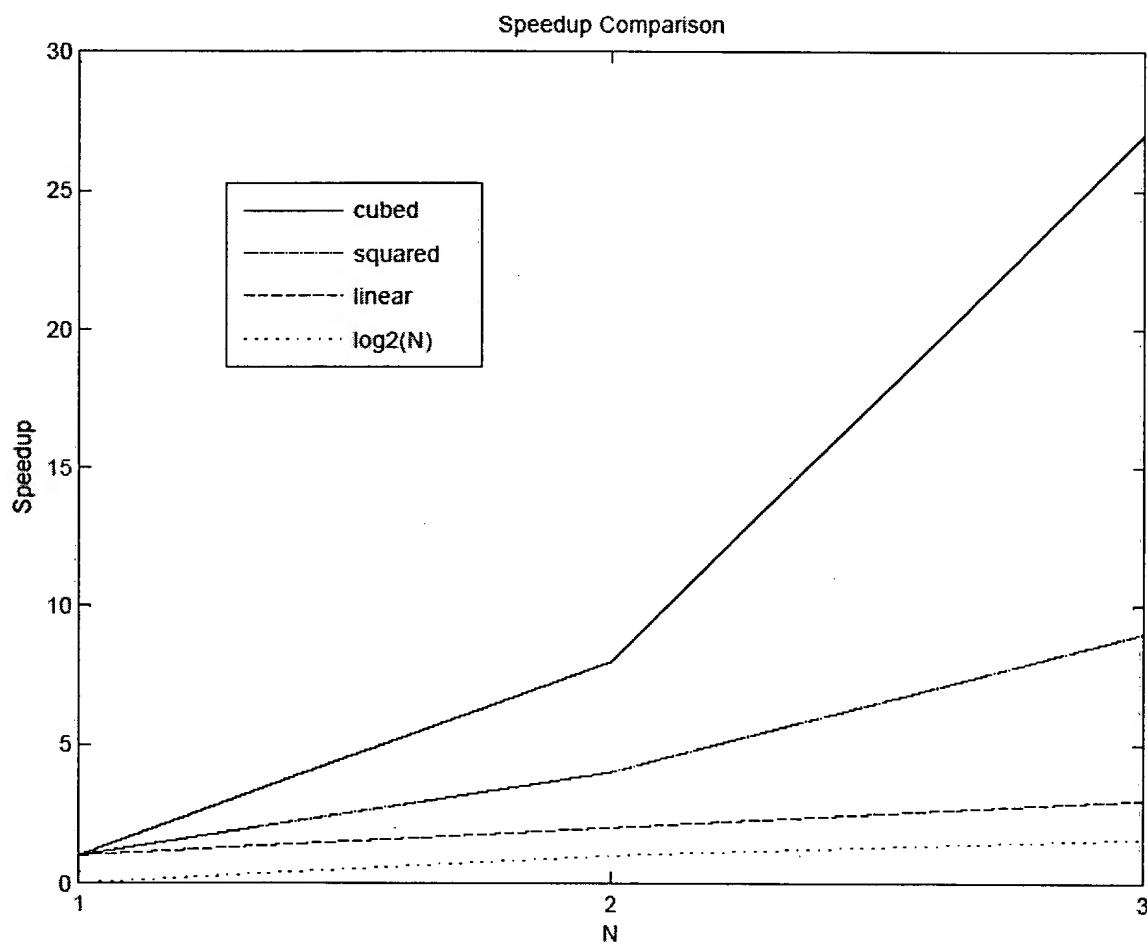
It is respectfully submitted that claim 9 has been amended herein to require a “first physical computing device” and a “second physical computing device.” The Liu reference does not teach or suggest a distributed simulation using a “first physical computing device” and a “second physical computing device.” As disclosed in section 6.5 of Liu, the disclosed simulation “runs as a Java applet.” It is therefore respectfully submitted that claim 9 is allowable over the cited references.

Claims 12-13, 19-20 and 24-26 depend from claim 9 and therefore include all of the elements of claim 9. It is therefore respectfully submitted that claims 12-13, 19-20 and 24-26 are allowable over the cited references for at least the reasons recited above with respect to claim 9.

D. Claims 40-42 were rejected under 35 U.S.C. §102(b) as being anticipated by Bain.

Claim 40 specifically recites “running a continuous-time simulation...in a set of n computing devices...wherein the running occurs with a speed greater than $O(n)$ times the speed of the simulation using a single one of the computing devices.” This recited element of Applicants’ claim 40 is not shown or suggested in Bain. The Bain reference relates to an event scheduler for synchronizing discrete-event simulations. Bain’s performance analysis is not relevant to the present invention as Bain refers to the overhead related to the broadcast of scheduling messages across the nodes of a parallel system. Overhead is said to be $O(D)$, where D is the diameter of the parallel system, and $D = \log_2 N$ for a hypercube configuration of nodes.

It is respectfully submitted that these numbers have nothing to do with speedup relative to a single process. However, assuming *arguendo* that Bain's $O(\log_2 N)$ does represent speedup as defined in Applicants' claim 40, this speed is less than " $O(n)$ times the speed of the simulation using a single one of the computing devices" as required by Applicants' claim 40, as demonstrated by the following chart:



It will be noted that $O(\log_2 N) < O(N)$ for all N . It is therefore respectfully submitted that Applicants' claim 40 is allowable in view of the references of record.

Claims 41-42 depend from claim 40 and therefore include all of the elements of claim 40. It is therefore respectfully submitted that claims 40-41 are allowable over the cited references for at least the reasons recited above with respect to claim 40.

E. Claims 1-8, 10-11, 27-29, 31-33 and 36 were rejected under 35 U.S.C. §103(a) as being unpatentable over Liu in view of DMSO Facility reference.

Claims 27 and 28 have been canceled herein, therefore their rejection under 35 U.S.C. §103(a) is considered to be moot.

Claim 1, as amended, specifically requires “a first executing process [and] a second executing process that receives said first series of state-related numerical values from said first executing process without said first series of state-related numerical values passing through a central communication process.” It is respectfully submitted that the above-recited element of Applicants’ claim 1 is not shown or suggested in the combination of Liu and DMSO.

The Liu reference teaches a finite state machine that has nothing to do with the present invention. The simulation described by Liu is executed as a single process. As disclosed in section 6.5 of Liu, the disclosed simulation “runs as a Java applet.” The Office Action appears to allege that the combination of Liu with DMSO will yield “first and second continuous-time models programmed in different programming languages” (Office Action ¶36). As detailed in the attached Declaration of Oleg Wasynczuk, the DMSO architecture requires all communication between all of the subsystems to be routed through a central communication process (Wasynczuk ¶¶10-12). Claim 1 has been amended herein to require that the second executing process “receives said first series of state-related numerical values from said first executing process

without said first series of state-related numerical values passing through a central communication process.” It is respectfully submitted that the above-recited element of Applicants’ claim 1 is not shown or suggested in the combination of Liu and DMSO.

Claims 2-8, 29 and 31-33 depend from claim 1 and therefore include all of the elements of claim 1. It is therefore respectfully submitted that claims 2-8, 29 and 31-33 are allowable over the cited references for at least the reasons recited above with respect to claim 1.

Claim 9 was not rejected under 35 U.S.C. §103(a), but dependent claims 10-11 and 36 were. Claims 10-11 and 36 depend from claim 9 and therefore include all of the elements of claim 9. It is therefore respectfully submitted that claims 10-11 and 36 are allowable over the cited references for at least the reasons recited above with respect to the 35 U.S.C. §102 rejection of claim 9.

F. Claim 39 was rejected under 35 U.S.C. §103(a) as being unpatentable over Liu in view of Bain.

Claim 39, as amended, specifically requires “wherein the simulation of the physical system occurs with a speed greater than $O(n)$ times the speed of the simulation using a single one of the computing devices.” As discussed hereinabove, Liu does not teach simulation on multiple computers and Bain does not teach greater than linear speed increases. It is therefore respectfully submitted that claim 39 is allowable over the references of record.

G. Evidence of Commercial Success of the Present Invention

Applicants have established above that the present invention is not rendered obvious by the references relied upon in the Office Action. Applicants are also submitting herewith evidence concerning objective indicia of non-obviousness. Accompanying this response is the Declaration of Dr. Paul C. Krause (“Krause”). This declaration demonstrates the commercial success of the invention and the risk of copying by competitors, and identifies the problems existing in the art that the invention solves.

As explained further in the declarations, P.C. Krause and Associates, Inc., owner of the present application, makes and sells products that correspond to the claims at issue (the “covered products”). Krause, ¶¶ 4-5. The covered products have enjoyed outstanding commercial success. Krause, ¶¶ 6-10 and 17. In a market comprised of extremely technically sophisticated customers, see Krause, ¶ 11, the covered products have sold to some of the largest aerospace companies in the world. Krause, ¶ 7.

The covered products are purchased due to their superior performance over competing products. Krause, ¶ 11. Particularly, the covered products allow distributed simulation of physical systems to run on separate computers (or separate processes on the same computer) or in different languages. Krause, ¶ 5. The covered products allow an extremely large improvement in simulation speed as compared to other known techniques, see Krause, ¶¶ 5, 13 and 16, a result disclosed and claimed in the present application. An extremely sophisticated aerospace company has written an article detailing the large speed increase obtained using the covered products and describing them as “new” and “significant improvements.” Krause, ¶ 13. These results were published in the prestigious technical journal *Aerospace Engineering*. Krause

¶ 13. Similarly, the Air Force Research Laboratory featured the covered product in their *Technology Horizons* magazine, reporting a 981-fold speed increase through the use of the covered product. Krause, ¶ 15. Air Force personnel reported in this magazine that use of the covered product allowed simulation “at a level of detail not before possible.” Krause, ¶ 16.

The commercial success of the covered products is due to the structure and function claimed in the present application, not due to extrinsic sources such as advertising changes or escalation, reduction of prices or opening of new markets. Krause, ¶ 11.

Further, the covered products solve the simulation speed problems present in competing products and prior art references. Krause, ¶¶ 13, 16. The solution to these problems is found in the features disclosed and claimed in the present application. Krause, ¶ 5. Given the competitiveness of the market and the improved structure and function of the covered products, it is believed that the covered products would be copied if competitors were assured that no patent protection was available for the covered products. Krause, ¶ 19.

Consequently, there is substantial evidence of non-obviousness in the commercial success of the covered products, the problems it solves, and the risk of copying by competitors. The objective evidence presented herewith should be considered by the Examiner, and it is respectfully maintained that that evidence warrants a conclusion of non-obviousness in and of itself. Given the deficiencies of the cited references as well, it is believed that the claims of the present application are clearly allowable.

CONCLUSION

For the foregoing reasons, Applicants submit that all claims are in a condition for allowance, and respectfully request a prompt Notice of Allowance for all pending claims. It should be understood that the above remarks are not intended to provide an exhaustive basis for patentability or concede the basis for the rejections and/or objections in the Office Action.

The original application included 5 independent and 37 total claims, and after the amendments above the application has 4 independent and 37 total claims, therefore no excess claim fees are believed to be due. The Commissioner is authorized to charge the Information Disclosure Statement fee, the three-month request for extension fee and the request for continued examination fee in the amount of \$1,085.00 to the credit card detailed on the attached form PTO-2038. No additional fees are believed to be required with this Amendment; nevertheless, the Commissioner is hereby authorized to charge any fees due, including statutory fees for extensions of time, to Deposit Account No. 23-3030, but not to include any payment of issue fees.

Reconsideration of the present application, as amended, is respectfully requested. If there are any remaining issues that can be addressed telephonically, the Examiner is invited to contact the undersigned to discuss the same.

Respectfully submitted,

By: 

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